

CRITICAL THINKING AND PREFERRED COGNITIVE
//
STYLE OF NURSING STUDENTS

A Graduate Thesis
Presented to
The Division of Nursing
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In Partial Fulfillment
of the Requirements for the Degree
Master of Science in Nursing

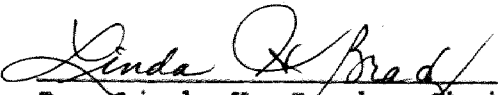
Marjorie Bledsoe
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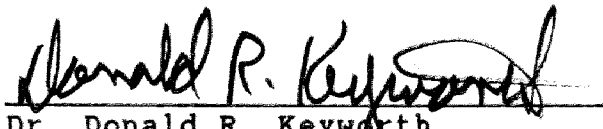
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CRITICAL THINKING AND PREFERRED COGNITIVE STYLE OF NURSING STUDENTS

An Abstract of a Thesis by
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August 1990
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The problem

This study was to determine the difference in critical thinking ability between student nurses with differing preferred cognitive styles.

Procedure

Nursing students and psychology students from intact sampling groups participated in an exploratory descriptive study. Both groups were tested on the Watson-Glaser Critical Thinking Appraisal and the Human Information Processing Survey.

Findings

There was a difference between nursing students, and non-nursing students' critical thinking scores ($t = 2.0513$, $p = .0429$). A negative correlation was found between the interpretation subtest scores and the preferred cognitive style scores ($\text{coef} = -0.3790$, $p = .0079$). A positive correlation was found between the assumption subtest scores and the scores of those with no preferred cognitive style among the non-nursing students ($\text{coef} = 0.6466$, $p = .0231$).

Conclusions

The results suggest a significant difference between the critical thinking ability of nursing students and non-nursing students. Two subtests on the Watson-Glaser Critical Thinking Appraisal were affected differently by the preferred cognitive style scores than the other three subtests.

Recommendations

Further research, including replication with a different sample and methodological investigation of critical thinking tools, is suggested.

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CHAPTER I

INTRODUCTION

The purpose of this study was to determine the difference in critical thinking ability among student nurses with differing preferred cognitive styles. With the increasingly complex health issues facing nursing, it is essential that nurses have the ability to think critically. It is not reasonable to expect students or nurses to assimilate the vast amounts of knowledge accumulating in the nursing field without teaching them to think critically. In order for nurses to assimilate this knowledge they will need to develop greater skills of decision making, evaluation, and judgment. Critical thinking skills enable nurses to process information and arrive at valid decisions and judgments. A key to competent, skillful nursing practice in the future lies in the nurse's cognitive abilities (Pardue, 1987).

With the advances in biomedicine, nurses will be involved in decisions about more complex ethical and moral issues. Decisions concerning these issues often have no clearly correct answers. Therefore, the need is great for nurses who can think critically. If critical thinking is essential for nurses to acquire, then nursing educators must be sensitive to the question of how to teach the process of critical thinking.

The study of thinking is well grounded in the disciplines of philosophy, psychology, and education. Robert Ennis (1962) stated the goal of education is to increase the ability to think. Critical thinking, a complex process, is the ability to reach conclusions on issues which may or may not have correct answers. Critical thinking includes both dispositions and abilities (Ennis, 1987). Robert Ennis (1987) contended that critical thinking involved a creative as well as a judgmental component. This thinking involves the use of both the right and left brain hemispheres (Levy, 1985; Ruggiero, 1988). Therefore, critical thinking draws on both hemispheres of the brain (Ennis, 1987; Levy, 1985). It is important for research to determine whether any relationship exists between how persons think and their critical thinking ability.

Researchers in education have identified that each individual has a preferred cognitive style (Gray, 1980). Studies were conducted that examined the influence of the preferred cognitive style on academic achievement and also on reading achievement (Fountain & Fillmer, 1987; Van Giesen, Bell, & Roubinek, 1987). No studies could be found that dealt specifically with critical thinking and preferred cognitive style.

Limited research in critical thinking has been documented in nursing education. Studies have addressed critical thinking and academic programs (Frederickson & Mayer, 1977; Gross, Takazawa & Rose, 1987; Pardue, 1987). As in general education, no research in nursing education could be found which addressed critical thinking and preferred cognitive style. This is an area in which research is needed.

Traditionally, educators have tended to teach toward the left hemisphere of the brain to the neglect of the right side. Lectures and reading assignments are teaching methods directed at the left brain (Holbert & Thomas, 1988). These teaching methods, lectures and reading assignments, are used more often in the classroom setting than other methods such as journal writing or debating (Holbert & Thomas). Because of this teaching pattern, the right side of the brain is not as highly developed. People utilize the side of the brain that is most comfortable to them, which would be the one most developed. In most people, the more developed is the left side, while the right side, which tends to be more creative and holistic, is ignored (Gray, 1980). If critical thinking is enhanced by a preferred cognitive style, then teaching methods need to be directed to this cognitive style.

The purpose of this research study was to determine the difference among nursing students' critical thinking ability as a function of their preferred cognitive style. The sample consisted of freshman diploma nursing students. Non-nursing students from a lower division psychology college class were also included in the study for purposes of comparison. Although the focus of this research was on the difference in the critical thinking ability of students with differing cognitive styles, any differences between the cognitive styles and the critical thinking ability of the two student groups also were identified. The testing of the students was completed before any teaching on the subject of critical thinking.

Definition of Terms

For the purposes of this study, terms of major significance were conceptionally and operationally defined as follows:

1. Preferred cognitive style designates the dominant brain hemisphere used for thinking. It seeks to identify how persons perceive and respond to stimuli in their environments. The terms human information processing patterns, preferred cognitive style, and thinking style were used synonymously in this study. Preferred cognitive style was operationally measured by the Human Information Processing Survey (HIP) (Taggart & Torrance, 1984). Three separate scores were reported from the Human Information Processing Survey: preferred right cognitive uses the right hemisphere of the brain; preferred left cognitive uses the left hemisphere of the brain; preferred integrated cognitive style uses right and left hemispheres of the brain simultaneously.

A subject must have received a score of 120 in any one of the three areas to have a preferred cognitive style in that area. For example, to be scored as preferred right hemisphere the subject must have scored at least 120 or greater in that area. It was very rare that any person would score 120 or greater in more than one area. If

this occurred, the higher score was considered the preferred cognitive style.

2. Mixed strategy is the term applied when a subject did not score 120 in any of the three areas. No preferred cognitive style was then identified for this subject. A mixed strategy person uses either the right or the left side of the brain and has no preference. This is different from an integrated strategy because the subject does not use both hemispheres simultaneously.

3. Critical thinking is the ability to address issues which may or may not have correct answers and arrive at conclusions with the justifications for the conclusions (Ennis, 1987). It includes the use of inference, the recognition of assumptions, deductive reasoning, interpretation of data, and evaluation of arguments. Critical thinking involves both a creative and judgmental phase. Both hemispheres of the brain are utilized in the process. Critical thinking was operationally defined by the Watson Glaser Critical Thinking Appraisal (1980). Raw scores were obtained by adding the number of correct answers on each of the five subtests and then totaling the subtest scores. Eighty is the highest possible total comprehensive score and 0 is the lowest.

4. Thinking is "any mental activity that helps formulate or solve a problem, make a decision, or fulfill a desire

to understand. It embraces only purposeful mental activity over which a person exercises some control" (Ruggiero, 1988, pp. 1-2).

5. Nursing students were all freshmen nursing students 18 years or older enrolled in a diploma nursing program in the fall of 1989 who agreed to participate in the study.

6. Psychology students were all students 18 years or older enrolled in a lower division general psychology class in a liberal arts university in the fall of 1989 who agreed to participate in the study.

Null Hypotheses

1. Ho: There will be no significant difference in the critical thinking ability among nursing students with an integrated cognitive style, nursing students with a preferred left cognitive style, and nursing students with a preferred right cognitive style.
2. Ho: There will be no significant difference in the critical thinking ability between nursing students with a preferred cognitive style and nursing students with no preferred cognitive style (mixed).
3. Ho: There will be no significant difference in the critical thinking ability between non-nursing students with a preferred integrated cognitive style, non-nursing students with a preferred left cognitive style, and non-nursing students with a preferred right cognitive style.
4. Ho: There will be no significant difference in the critical thinking ability between non-nursing students with a preferred cognitive style and non-nursing students with no preferred cognitive style (mixed).
5. Ho: There will be no significant difference in the critical thinking ability between nursing students and non-nursing students.

Limitations

A limitation of the research was that subjects were not selected by a random procedure. The small sample size and the fact that the researcher did not control any of the variables in the study were limitations in the research. The findings of the study cannot be generalized to any other setting or groups.

Significance of the Study to Nursing

There is a need for empirical studies on the critical thinking process in the nursing profession. Critical thinking is an essential component of nursing practice.

This research will benefit nursing educators by supporting the necessity to address the question of how to teach the process of critical thinking. The results of the study can be useful to nursing educators in preparing their curricula. Nurses need to be able to identify and analyze health care issues and arrive at valid assumptions and conclusions based on the critical thinking process. Nurses need to know how to think critically in order to implement the nursing process, the basis for nursing care. Nursing is in a state of change and it is during such unsettling change that critical thinking is most necessary (Brookfield, 1988).

If nursing students can be taught to improve their ability to think critically, they should be able to make more valid decisions, evaluations, and judgments. If this occurs, better nursing care will be delivered to the client as a result.

The nursing profession will benefit from leaders who are better critical thinkers. The nursing profession is not identified as one in which persons are decision makers or thinkers. It is necessary to change this belief, and teaching critical thinking can help facilitate this process by developing nurses who are recognized for their ability to think critically and make sound decisions.

Five years after a clinical nursing specialist graduates, 40% of the acquired knowledge and 50% of the technical equipment are obsolete (McCormick 1983). It is important for the growth of the profession to teach the process of critical thinking so that nurses will be able to apply the principles of critical thinking to new learning and technology. Nursing research related to critical thinking is limited. Nursing educators could benefit from research which addresses any new information on how to teach critical thinking effectively.

CHAPTER II

REVIEW OF THE LITERATURE

The conceptual framework addressing critical thinking for this study will be presented first. Studies completed on right and left brain dominance then will be presented. Literature related to right and left preference and the processing of information will then be discussed, followed by research examining the relationship between right and left brain preference and academic achievement. The review will conclude with studies of critical thinking and preferred cognitive style found in the nursing education literature.

Educators, philosophers, and psychologists have all been concerned with critical thinking. Robert Ennis (1987), a professor of philosophy of education at the University of Illinois, has offered an extensive theory on critical thinking and its implications for the educational process. Ennis's (1987) concept of critical thinking includes both a creative and a judgmental component. This study defined critical thinking as having these components, therefore, it seemed the most appropriate conceptual framework to accept for the basis of the study.

Ennis (1987) defined critical thinking as "reasonable reflective thinking that is focused on

deciding what to believe or do" (p. 10). Included in this definition is a creative component. Ennis (1987) stated, "Formulating hypotheses, alternative ways of viewing a problem, questions, possible solutions and plans for investigating something are creative acts that come under this definition" (p 10).

To utilize the critical thinking process effectively, an individual needs a combination of two factors: a particular frame of mind, also known as the dispositions, in conjunction with certain operational skills, also known as the abilities. Ennis (1987) asserted that thinking critically involves the use of both dispositions and abilities.

The dispositions are references of how to act or proceed when implementing critical thinking. They act as guidelines for a person to follow in the process of critical thinking (Ennis, 1987). Specifically, dispositions are the tendencies to seek a clear statement of the question; to take into account the total situation; to be well informed; to remain relevant to the main point; to seek alternatives; to take a position and to change it when the evidence and reasons are sufficient to do so; to remain open-minded and to be sensitive to the feelings, level of knowledge, and degree of sophistication of others (Ennis, 1987).

In order to think critically, however, a person must also have certain abilities. The abilities needed in critical thinking are clarity, basic support, inference and interaction (Ennis, 1987). Ennis used the situation of serving on a jury to help explain many of these abilities. Each ability will be discussed separately using the jury trial analogy.

The first ability is clarity. Because this category contained many smaller abilities, Ennis (1987) divided it into elementary and advanced clarification groups. Elementary clarity involves focusing on a question. A problem, hypothesis, or thesis is identified when focusing on the question. One must then decide if the hypothesis is acceptable. In a jury trial, the jury must focus on a question such as: Did the defendant commit the murder? Another clarifying ability includes analyzing arguments. Again, in the jury experience, one would have to identify the conclusions of the defense and prosecuting attorneys. Asking questions of clarification or challenge dealing with the main point are important clarifying abilities. The facts of the case and how the main point might be exemplified are pursued. Elementary

dimensions: form, definitional strategy, and content. Defining a term by form entails its synonym, classification, equivalent expression, operational definition, or example. Definitional strategy is the reported definition, stipulative definition, or positional definition given a term. The handling of any equivocation, such as Is the definition or term misleading?, is dealt with during this time. Finally, the content of the situation must be examined when judging the definition (Ennis, 1987).

The second ability is basic support, which includes statements made by others, observations, and inferences that one has made previously. Observation and judging the credibility of a source are key abilities. Much of what is believed comes from other people, so judging the credibility of a source is a key ability to acquire. Ennis (1987) listed criteria under each of the abilities which may or may not have to be employed, depending on the person's present knowledge of the situation. If the situation is beyond the person's present knowledge, then criteria such as expertise and reputation of the source, use of established procedures, and known risk to reputation can be used (Ennis, 1987).

The third ability, inference, includes deductive inference, inductive inference, and inference to value

judgments. Deduction is the way something follows necessarily from something else. In the jury experience, if all the conditions were not satisfied for the murder, a guilty conviction could not be reached. Induction is generalizing and inferring to hypotheses that are supposed to explain the facts. The best hypothesis is determined with the given facts. The last inference is making value judgments. The jurors asked, "What ought normally be expected?" They were making a value judgment (Ennis, 1987).

The fourth ability involves interacting with others in presentations, debates, and written work. This interaction requires the application of clarity, basic support, and inference. Decision making is carried out during this phase. Argumentation, either oral or written, is the final step in this grouping (Ennis, 1987).

There are two goals of critical thinking according to Ennis (1987). The first is that a conclusion to an inquiry be reached, and the second is that a justification of that conclusion be given. Because critical thinking usually involves conclusions that cannot be tested, justification is offered to support the conclusion.

The model of critical thinking formulated by Ennis (1987) includes the use of both the production and the judgment phase of thinking. Similarly, Ruggiero (1988) proposed that thinking involves two phases: the production phase and the judgment phase. The production phase focuses on the production of ideas. It is in this phase that "the mind produces various conceptions of a problem or issue, various ways of dealing with it and possible solutions or responses to it" (Ruggiero, 1988, p. 3). Good thinkers tend to see many ways of dealing with problems and many different solutions. In the judgment phase, the mind examines and evaluates the idea, makes refinements, if needed, and reaches a judgment or conclusion. Good thinkers test their assumptions, make distinctions and base their conclusions on sound evidence rather than on their feelings (Ruggiero, 1988). This would correspond to Ennis's (1987) conception of critical thinking in which both a creative and judgmental component are included. The right brain is dominant during the production phase of thinking, and the left brain is dominant during the judgment phase of thinking (Levy 1985). Therefore, both hemispheres of the brain are used during the critical thinking process. If one hemisphere of the brain is less developed than the other, it would seem that at least part of the critical thinking

process would be hindered. Furthermore, it would seem that faulty conclusions could be reached if either the production or the judgment phase of the critical thinking process were weakened by an underdeveloped brain hemisphere.

The teaching of critical thinking is one of the goals of educators. How best to teach this process has not yet been determined. Since critical thinking does involve both hemispheres of the brain, a review of relevant research on hemisphericity and critical thinking would seem appropriate. Research findings indicate that the brain possesses two different and complementary ways of processing information. Extensive research was conducted in the late 1950s and the 1960s on right and left brain dominance by Dr. Roger Sperry and associates (Gazzaniga, Bogen, & Sperry, 1962, 1963, 1965; Gazzaniga & Sperry, 1967). Dr. Sperry (1962) discovered that the left hemisphere governed verbal speech and the right hemisphere governed the processing of visual images. The left hemisphere governed the spoken word while the right hemisphere governed what the subject saw.

Studies conducted on subjects who had the corpus callosum (a band of tissue that connects the two hemispheres) severed demonstrated that visual, tactual, proprioceptive, auditory, and olfactory information

presented to one hemisphere could be processed only by that hemisphere (Gazzaniga, Bogen, & Sperry, 1962, 1963, 1965; Gazzaniga & Sperry, 1967). Sperry and associates (Gazzaniga, Bogen, & Sperry, 1962, 1963, 1965; Gazzaniga & Sperry, 1967) found that each side of the brain processes information in different ways. The left hemisphere governs the use of language, logical reasoning, analysis, and the performing of sequential tasks, while the right brain controls nonverbal, symbolic, and intuitive responses. These findings indicated that the right hemisphere was superior to the left in spatial tasks such as imaging and shapes, but was deficient in verbal tasks such as decoding complex syntax, short-term verbal memorization and phonetic analysis (Gazzaniga, Bogen & Sperry, 1962, 1965; Gazzaniga & Sperry, 1967).

Although each side of the brain is specialized, the two sides must integrate their activities. This integration leads to behavior and mental processes greater than and different from each region's special contribution (Levy, 1985). Levy stated, "There is no activity in which only one hemisphere is involved or in which only one hemisphere makes a contribution" (Levy, 1985, p. 43). Levy believed both hemispheres are necessary to process information. Students learn

differently and, therefore, must be taught according to how they process information (Levy, 1983).

While no research has dealt specifically with the relationship of preferred cognitive style and the ability to think critically, a descriptive nonexperimental study by Fountain and Fillmer (1987) of 131 fourth - and seventh - graders demonstrated that integrated brain preference and academic achievement revealed some significant differences. The ANOVA data for fourth - grade reading, mathematics, language, and basic battery showed that the integrated hemisphere preference students achieved significantly higher than the preferred right or preferred left hemisphere students on all four tests. The data for the seventh grade did not show any significant differences among the three brain preference groups. The major implication of the study was that the students did process information differently and that the method of processing affected their learning and achievement.

Another descriptive study was conducted by Van Giesen, Bell and Roubinek (1987) on 64 subjects in the fourth and fifth grades comparing right brain, left brain, and integrated brain dominant students on reading achievement. The results showed no differences in achievement ($p = .0583$).

In nursing education no studies could be found which focused on the relationship between preferred cognitive style and critical thinking ability. However, some nursing research has been completed on critical thinking in relation to other variables.

An initial study on critical thinking in nursing was conducted by Frederickson and Mayer (1977) in a descriptive study of 55 students, 28 from five baccalaureate degree programs and 27 from three associate degree nursing programs. These researchers defined critical thinking as the ability to solve problems. All students were within one semester of graduation. An analysis of variance between the type of degree a student would receive and the student's performance on the testing was completed. The name of the critical thinking test was not identified. The results found baccalaureate students scored higher on critical thinking than associate degree students ($p = .01$). A major limitation of the study was the narrow definition of critical thinking.

Matthews and Gaul (1979) believed critical thinking was a factor in the formulation of a nursing diagnosis. The authors conducted a descriptive study of 48 nursing students using the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1964) and the Concept Mastery

Test (Terman, 1956). No relationship was evidenced in the Watson-Glaser Critical Thinking Appraisal scores and the ability to formulate a nursing diagnosis ($\rho = -0.140$, $p. < 0.535$).

A descriptive study that examined moral reasoning and critical thinking of 79 practicing nurses was completed by Ketefian (1981). The Watson-Glaser Critical Thinking Appraisal Test (Watson & Glaser, 1964) was used to measure critical thinking, and the Rest's Defining Issues Test (Rest, 1974) was used to measure moral judgment. The findings suggested that critical thinking was significantly related to moral judgment ($p = <.001$). The results also supported the hypothesis that critical thinking and educational preparation would predict greater variance in moral judgment than either variable alone ($f[2,75] = 18.3$, $p = .01$). Critical thinking and education together accounted for 32.9% of the variance in moral judgment.

Berger (1984) conducted a longitudinal study on 137 baccalaureate nursing students to determine whether there was a relationship between critical thinking ability and grade point averages in nursing and science courses. The Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1964) was used for the study. Pearson product moment correlation coefficients were computed with the

results indicating that there was no significant relationship between the critical thinking scores and grade point averages in either nursing courses or science courses ($r = .139$ and $.219$ respectively). The nursing students' mean average score of 77 on critical thinking was found to be higher when compared with the mean average score of 74 for the liberal arts freshmen and liberal arts senior students. The author did not indicate whether this was a significant difference.

A study completed by Gross, Takazawa and Rose (1987) examined the effect of nursing education on students' critical thinking abilities. A total of 108 associate and baccalaureate degree students were tested. Correlations showed a highly significant improvement ($p < .000$) in mean scores on the Watson Glaser Critical Thinking Appraisal (Watson & Glaser, 1980) between entry and completion of the program. It was determined, however, that there were no significant differences in the entry scores or in the exit scores between the associate and baccalaureate nursing students using the Watson Glaser Critical Thinking Appraisal.

A similar study by Sullivan (1987) of 46 subjects in a B.S.N. degree program examined the effect of nursing education on critical thinking, creativity, and clinical performance. Five students did not complete all

instruments. Critical thinking scores showed no significant difference between entry and exit levels ($t = .10$, $p = .918$). Mean grade point average and the clinical performance scores were significantly higher at graduation ($t = 3.19$, $p = .002$; $t = 3.46$, $p = .002$). The creativity scores were lower at graduation than at entry ($t = -2.54$, $p = .016$).

To examine eight variables that contributed most strongly to students' ability to think critically, Tiessen (1987) studied 150 subjects in a descriptive study which used the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1964). It was concluded that critical thinking abilities were significantly correlated with variables such as academic aptitude ($r = .38$, $p. = <.05$), academic experience ($r = .30$, $p. = <.05$), and quality of academic performance ($r = .32$, $p. = <.05$).

In a study completed by Pardue (1987), of 121 subjects, decision-making skills and critical thinking ability scores were found to be significantly different ($f = 7.20$, $p. = <.001$) among master's, baccalaureate degree, diploma and associate degree nurses. The results revealed that master's and baccalaureate degree nurses did have significantly higher critical thinking scores than associate degree or diploma nurses. There was, however, no significant difference in self-reported

perceived difficulty with decision making among the four groups ($f = 1.38$, $p = .250$). The Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980) and a decision-making skills instrument made for the study were used in the study.

This review of the nursing literature found a limited number of studies on critical thinking. Studies have been completed which dealt with critical thinking and various factors such as grade point averages, differences in critical thinking ability among students, and different types of nursing programs. However, no research could be found which examined the relationship between preferred cognitive styles and critical thinking ability of nursing students. Therefore, it would seem that research is needed to determine whether critical thinking is related to preferred cognitive styles. Knowing whether critical thinking ability is affected by preferred cognitive style would assist nursing educators.

CHAPTER III

METHODOLOGY

An exploratory descriptive design was used in this study to gain insight on critical thinking as a function of preferred cognitive styles. This approach was appropriate because no research has focused specifically on critical thinking and preferred cognitive style.

Setting

The study was conducted in the fall of 1989 in a diploma school of nursing and a liberal arts university. Both institutions are located within two miles of each other toward the center of a metropolitan midwestern city. The school of nursing is affiliated with a large teaching health care center which serves the immediate surrounding area. The university is a mid - sized private liberal arts institution.

Sample

A nonprobability convenience sampling method was utilized. All students in the freshman nursing class and all students enrolled in one lower division psychology class at the university were asked to participate in the research. The criterion for inclusion in the study was the enrollment in the nursing class or enrollment in the psychology class. The total sample invited to participate consisted of 82 nursing students and 50

psychology students. Eighty-two nursing students and 19 psychology students agreed to participate in the research. The psychology students were included in the study as a comparison group whose scores on the tests were used as a basis for evaluating the scores on the group of primary interest, the nursing students. The psychology students were thought to be similar in general characteristics to the nursing sampling, and therefore, their inclusion would increase the generalizability and validity of the study.

Instruments

Demographics of the sample were self-reported on a tool developed by the researcher to determine the general characteristics of the sample (see Appendix A). The Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980) (see Appendix B) was used to measure critical thinking because it is a simple multiple-choice test which enables objective scoring of results. The test had been used to evaluate critical thinking ability with nurses in previous studies (Frederickson & Mayer, 1977; Gross, et al., 1987; Ketefian, 1981; Pardue, 1987). Finally, the test was used because it included components found in the definition of critical thinking used for this study. The Critical Thinking Appraisal Test (Watson & Glaser, 1980) is an 80-item test that is self-

administered and yields a total score of the subject's critical thinking ability. The total score is a composite of the five subtests. The subtests are as follows:

Test 1--Inference: discriminating among degrees of truth or inferences drawn from given data (16 items).

Test 2--Recognition of assumptions: recognizing unstated assumptions or presuppositions in given statements or assertions (16 items).

Test 3--Deduction: determining whether certain conclusions necessarily follow from information in given statements or premises (16 items).

Test 4--Interpretation: weighing evidence and deciding whether generalizations or conclusions based on the given data are warranted (16 items).

Test 5--Evaluation of arguments: distinguishing between arguments that are strong and relevant and those that are weak or irrelevant to a particular question at issue (16 items) (Watson & Glaser, 1980).

The internal consistency of the test has been determined by reliability coefficients (split-half) that range from .77 to .83 (Watson & Glaser, 1964). The stability of responses over time is reflected by a .73 correlation between two administrations of the test to a

group of college students ($N = 96$) (Watson & Glaser, 1980).

Construct validity has been determined by use of the test in instructional settings designed to improve critical thinking and by comparison with other mental ability and comprehensive tests with .65 to .73 for the zm form (Watson & Glaser, 1964). Reports support the belief that the test is a valid estimate of critical thinking constructs (Frederickson, 1979).

The second research instrument was the Human Information Processing Survey (Taggart & Torrance, 1984) (see Appendix C). It is a 40-item multiple-choice paper and pencil test that was self-administered. Each subject was given three choices for each question. One choice corresponded with the right brain dominant, one choice corresponded with the left brain dominant, and one choice corresponded with no preference (integrated). The order of the three alternatives was randomized to minimize a pattern (Taggart & Torrance, 1984). A profile was obtained which included left dominant, right dominant and integrated scales. A standardized score was assigned to each scale. The number 100 was established as the average in the standardization of the scores (Taggart & Torrance, 1984). A subject must have received a standard score of 120 or greater in one of the three scales to be

identified as having right preference, left preference, or integrated preference (Taggart & Torrance, 1984). Those subjects who did not obtain a score of 120 or greater in any of the three scales were determined as having a mixed response (Taggart & Torrance, 1984).

The reliability and validity of the test have been established. The 40 questions of the Human Information Processing Survey (Taggart & Torrance, 1984) were included as form C from an older, well-established test called Your Style of Learning and Thinking (Torrance & Reynolds, 1980). Prior to the development of the Human Information Processing Survey (Taggart & Torrance, 1984), two alternate forms (A and B) had been developed for Your Style of Learning and Thinking (SOLAT). Each of these forms attempted to test the specialization of the right and left hemispheres (Reynolds, Riegel, & Torrance, 1977). Test reliability involved a test-retest study with the HIP Survey and form A of the SOLAT given one week apart to 50 undergraduate education majors. Pearson product-moment correlation coefficients for each of the three strategy scales were as follows: right .84, left .86, integrated .82 (Taggart & Torrance, 1984). The test items were constructed by Torrance and Reynolds after an extensive survey of the literature on the specialized cerebral functions of the hemispheres. Fifty questions

were in the original test with 40 items retained after item analysis data for internal consistency and expert judgment made by three serious students of hemisphericity research (Taggart & Torrance, 1984).

The construct validity study was conducted by Torrance with his graduate class of 33 students in creative thinking. It was stated that there is evidence to suggest that the essence of creative behavior calls for right hemisphere functions. A high degree of consistency was obtained for positive relationships between the creativity measures and right hemisphere scale scores and negative relationships with left hemisphere scale scores. Of the 15 coefficients of correlation for the right hemisphere scale 15 were statistically significant at the $p. = .05$ level or better (Taggart & Torrance, 1984).

Fischler (1985) criticized the instrument because of its inability to show consistent and strong relationships between scores derived from the instrument and scores derived from such hemisphericity measures as the Dichotic Listening Test (Alberts & McCallum, 1982) and The Conjugate Lateral Eye Movements Test (Riegel, 1979). Taggart and Torrance maintained this does not diminish the value of the instrument for studying preferred

hemisphericity since the validity was established by other means (Taggart & Torrance, 1984).

Procedures

Those students volunteering for the research were administered the Human Information Processing Survey (Taggart & Torrance, 1984) to determine their hemispheric preference and the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980) to determine their critical thinking ability. The nursing students were administered the tests as a group during their first week of scheduled classes in the fall of 1989. No monetary reward or extra credit points were given to the nursing students who participated in the study. The psychology students were administered the tests as a separate group outside of their regularly scheduled psychology classes in the fall of 1989. As an incentive to participate in the study, the psychology students received extra credit in their psychology class. The researcher administered all the testing. The purpose of the research study was explained to the subjects by the researcher. The students were informed of their right not to participate or to withdraw at any time. There were no punitive effects for nonparticipation in the study. Students received a copy of their own test results. Results of

the study were made available to both student groups via the individual instructors from each institution.

A written informed consent was obtained from each participant (see Appendix D). The subjects were provided a printed informed consent statement describing the research, protection of confidentiality, risk considerations, and the rights of human subjects. Confidentiality was ensured by using code numbers in place of the student's name. The approval of each Human Subjects Research Review Committee of the university and of the medical center was obtained.

CHAPTER IV

ANALYSIS

Introduction

In the following section, results pertaining to the relationship between critical thinking ability and preferred cognitive styles will be presented. The findings will begin with a description of the demographic characteristics of the sample. Critical thinking scores and preferred cognitive thinking styles of nursing students will be presented. Critical thinking scores of nursing students with preferred cognitive thinking styles will be compared with scores from nursing students with nonpreferred cognitive thinking styles. Critical thinking scores and preferred cognitive thinking styles of the psychology students will be presented in the same manner as the nursing students scores. Finally, critical thinking scores of nursing students and critical thinking scores of psychology students will be presented. Sample Characteristics

A total of 82 nursing students and 19 psychology students completed the Critical Thinking Appraisal Test (Watson & Glaser, 1980) and the Human Information Processing Survey (Taggart & Torrance, 1984). The

subjects ranged in ages from 18 to 46 with a mean age of 22.15 with a standard deviation of 6.517. Of the 101 subjects, 92 were female and 9 were male. Ninety-nine of the subjects had previous work experience. Most of the subjects had had menial-type jobs, while 4 subjects had management-type experience. All the subjects graduated from high school. The number of years since high school graduation ranged from 0 to 28 years, with the majority of the subjects indicating 0 to 5 years since high school. Of the nursing subjects, 10 had received from 1 to 4 years of postsecondary education. Two of the nursing subjects had received a degree from a four-year college. All of the psychology subjects were pursuing a college degree. All of the psychology subjects were freshmen and sophomores except one who was completing the senior year.

The findings failed to determine a significant difference among the critical thinking scores as a function of the preferred cognitive style. Each of the hypotheses will be discussed separately.

Hypothesis 1

An analysis of variance was conducted to determine whether there was a significant difference in the critical thinking scores of the nursing students as a function of their cognitive style. Table 1 summarizes

the results from that procedure. It was concluded that there was not a significant difference. Therefore, the first null hypothesis, which stated "There will be no significant difference in the critical thinking ability among nursing students with a preferred integrated cognitive style, nursing students with a preferred left cognitive style and nursing students with a preferred right cognitive style," was not rejected.

Table 1

Critical Thinking and Brain Preference of Nursing Students

Source	df	sum of squares	mean square	f-ratio	prob
L/R/I	2	180.644	90.3222	1.33	0.2766
Error	38	2581.310	67.9291		
Total	40	2761.950			

Hypothesis 2

A t test was conducted to determine whether there was a significant difference between critical thinking ability of nursing students with a preferred cognitive style and nursing students with no preferred cognitive style (mixed). Table 2 summarizes the results from that procedure. It was concluded that there was no significant difference. Therefore, the second null hypothesis, which stated "There will be no significant difference in the critical thinking ability between

nursing students with a preferred cognitive style and nursing students with no preferred cognitive style," was not rejected.

Table 2

T Test Analysis of Critical Thinking Ability Between Nursing Students with a Preferred Cognitive Style and Those with No Preferred Cognitive Style (Mixed)

Preferred cognitive mean	51.4600
Mixed	52.8000
t =	-0.7369
p =	0.4633

Hypothesis 3

Because there were no psychology students with an integrated cognitive style, a t test was completed to determine whether there was a difference in mean critical thinking scores between the critical thinking scores of the right and left preferred cognitive style. Table 3 summarizes the results from that procedure. The results indicated that there was not a significant difference. Therefore, the third hypothesis, which stated "There will be no significant difference in the critical thinking ability among non-nursing students with a preferred integrated cognitive style, non-nursing students with a preferred left cognitive style and nonnursing students with a preferred right cognitive style," was not rejected.

Table 3

T-Test Analysis of Critical Thinking Ability Between
Psychology Students with a Preferred Right and Left
Cognitive Style

$t = 1.988$

$p = >0.05$

Hypothesis 4

A t test was conducted to determine whether there was a significant difference in critical thinking ability between psychology students with a preferred cognitive style and psychology students with no preferred cognitive style. The results of the procedure are summarized in Table 4. No significant difference was identified. Therefore, the fourth null hypothesis, which stated "There will be no significant difference in the critical thinking ability between non-nursing students with a preferred cognitive style and non-nursing students with no preferred cognitive style," was not rejected.

Table 4

Non-Nursing Students with Preferred Cognitive Style and
Non-Nursing Students with No Preferred Cognitive Style
(Mixed)

preferred cognitive style mean	54.56
mixed mean	57.75
$t =$	-0.6776
$p =$	0.5072

Hypothesis 5

A t test was conducted to determine whether there was a difference between critical thinking ability of nursing students and critical thinking ability of psychology students. Table 5 summarizes the results of that procedure. A significant difference was found. The psychology students scored significantly higher than the nursing students on the Watson-Glaser Critical Thinking Appraisal. Therefore, the fifth null hypothesis which stated "There will be no significant difference in the critical thinking ability between the nursing students and the non-nursing students," was rejected.

Table 5

Critical Thinking Scores of Nursing Students and Non-Nursing Students

Psychology students mean	56.5800
Nursing students mean	52.1300
$t =$	2.0513
$p =$	0.0429

Serendipitous Findings

Although it was not hypothesis-driven, the five subtests of the Watson-Glaser Critical Thinking Test (Watson & Glaser, 1980) were examined to determine any relationships with the preferred cognitive style scores. The five subtests were: inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments.

Pearson-product moment correlations were completed on the five subtests of the Watson-Glaser Critical Thinking scores and the scores of those students with preferred cognitive style scores to determine any relationships. Two significant correlations were determined. The first subtest, interpretation scores, was found to correlate negatively with the the preferred cognitive style scores with a coefficient of -0.3790

($p = 0.0079$). This means the higher the interpretation scores, the lower the preferred cognitive style scores. The second significant positive correlation was found between the subtest assumption scores and the scores of those with no preferred cognitive style with a coefficient of 0.6466 ($p = 0.0231$). No other significant correlations were found.

CHAPTER V

DISCUSSION

Discussion of Results

This was an exploratory study to investigate critical thinking and preferred cognitive styles of nursing students. Three significant findings were determined from the research. The first finding determined that there was a significant difference between nursing students and non-nursing students' critical thinking scores ($t = 2.0513$, $p = 0.0429$). Nursing students scored significantly lower on the critical thinking test than the psychology students. This is contradictory to the results obtained by Berger (1984), which revealed that baccalaureate nursing students had higher critical thinking scores than liberal arts students. Berger's study, however, did not include associate degree, diploma, or master's degree nursing students. In the research completed by Pardue (1987), it was determined that nurses with master's and baccalaureate degrees had higher critical thinking scores than nurses with diploma and associate degrees. The results from these two studies leads one to speculate that nursing students from baccalaureate and master's degree programs have higher critical thinking scores than liberal arts students. This study used only diploma

nursing students and students from one lower division psychology class. A replication of the study using associate degree, diploma, baccalaureate, and master's degree nursing students is needed to determine whether there is a difference in the critical thinking scores among nursing students. The study also should include non-nursing students from a wide range of disciplines to determine whether their critical thinking scores would be different from the nursing students' scores or the psychology students' scores.

As indicated by the findings, these diploma nursing students are starting their educational program with a deficit in their critical thinking ability. Further research is needed to determine whether there are variables which affect a nursing student's critical thinking ability. Some of the variables to examine could be the number of years since high school graduation, age, gender, academic performance, and work experience. As the findings indicate, nursing educators have the challenge of increasing a student's critical thinking ability through effective teaching methods.

A Pearson product moment correlation was completed on the five subtests of the Watson-Glaser Critical Thinking Test (Watson & Glaser, 1980) scores and the scores of those students with preferred cognitive style

scores. Two significant correlations were determined. Each finding will be discussed, followed by a discussion relating to both of the findings. The interpretation subtest scores had a negative significant correlation with the preferred cognitive style scores ($n = 48$, coef. -0.3790 , $p = 0.0079$). This means that the higher the interpretation score, the lower the preferred cognitive score. The interpretation score was affected differently by the preferred cognitive style than the other four subtests.

A significant positive correlation was found between the assumption subtest scores and the scores of those with no preferred cognitive style among the non-nursing students ($n = 12$, coef. 0.6466 , $p = 0.0231$). This means that the higher the mixed score, the higher the assumption score. With the small sample size, one is reluctant to draw conclusions. It leads one, however, to question what is different about this section which contributes to this relationship. Other nursing research on the subtests was not available, making comparison of the findings impossible.

The two findings cause one to inquire about the critical thinking tool. Is the tool reflective of the expanded definition of critical thinking? Is the tool testing all aspects of critical thinking? Does critical

thinking ability require more than one measurement tool? Is critical thinking something that is not completely measurable by a pen and pencil test? It would seem important for methodological research to be completed which investigates the measurement tool.

In the above three findings the possibility of a Type-I error cannot be eliminated. It is possible that the findings occurred by chance. The level of significance used was .05.

In discussing the research, factors affecting internal and external validity must be addressed. Two sample groups were used for comparison in the study. The subjects were not randomly selected, but rather chosen from intact sampling groups. Because of this selection process, the possibility exists that the groups were not equivalent. Therefore, the subject selection was a threat to the internal validity. Future research using randomly selected groups would be desirable. Generalization of the results cannot be made.

Mortality of the sample was another threat to internal validity. Of 50 psychology students invited to participate in the study, 31 students chose not to participate. Only 19 students participated in the research. Those who remained in the study may not have been representative of the group as a whole. This small

number increased the sampling error since smaller samples tend to produce less accurate estimates of the total population.

Lack of motivation of the psychology students may have affected their participation in the study. To increase rapport, a more personal approach should have been taken. Making the students' participation seem important to the research and emphasizing the need for full participation may have increased the sampling size.

Although the study failed to reject four of the five hypotheses concerning critical thinking ability and preferred cognitive style, some interesting questions arise as a result of these findings. Could critical thinking be unaffected by preferred cognitive styles? Does how one thinks not affect the ability to think critically? This research on preferred cognitive style and critical thinking ability was limited by the small sample. The possibility of a Type - II error cannot be dismissed when evaluating the results. The null hypotheses could have not been true but were supported as such.

The fact that the test for critical thinking is valid and the test for dominant preferred cognitive style is valid may be offset by the difficulty encountered when comparing the two. The critical thinking test may be

skewed toward the left brain thinker because one must read the material to take the test and because linear processing is necessary by the mind during the testing. The Human Information Processing Survey (Taggart & Torrance, 1984) is the best developed paper and pen test which determines preferred cognitive style, but it may be that the abilities which determine these dominant areas are not that easily measured by a paper and pen test. Maybe, therefore, preferred cognitive style could be determined by other non-written testing tools such as the Dichotic Listening Test of Hemispheric Dominance (Alberts & McCallum, 1982) or the Conjugate Lateral Eye Movement Measure (Riegel, 1979).

The majority of the students in the sample were female. Perhaps the critical thinking tool has a gender bias toward males. Carol Gilligan (1982) has written that there are differences between men's and women's cognitive styles. Perhaps the testing tool is written toward the male gender, which would cause the female subjects to receive lower scores.

One cannot rule out the possibility that different testing tools could result in different findings. This study used the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1980) for two reasons: (a) it was most often used in nursing research studies and (b) it was

determined to be a well-developed, measurement tool with high reliability and validity. That by itself does not rule out the replication of the study using a different critical thinking testing tool. Other critical thinking testing tools have been developed and could be used. Robert Ennis's (1987) conceptional framework was the basis of this research. Although Ennis (1987) has developed two tools for critical thinking, one is an essay-form tool and the other is an objective multiple-choice tool, The Watson-Glaser Critical Thinking Appraisal (1980) has set the methodological precedent for nursing research. The Watson-Glaser test may no longer reflect the newer definition of critical thinking. The test was first developed in 1964; since that time the definition of critical thinking has evolved to include a broader prospective. The newer definition now includes a creative component. Research examining the essence of this tool would be helpful.

The importance of developing teaching skills that enhance a student's ability to think critically cannot be dismissed. More research needs to be conducted which examines preferred cognitive styles using a larger sample and perhaps a different tool for measuring critical thinking.

The findings from this study are useful to nursing. Nursing students were found to score significantly lower than psychology students on the Watson-Glaser Critical Thinking Appraisal. This is valuable information for nursing educators to know. Any research which investigates the possibilities for improved teaching will benefit the nursing profession. The fact that the findings did support the null hypotheses does not make the research without merit. It may be that the preferred cognitive style does not influence the person's ability to think critically, which is valuable information. Therefore, teaching directed to a preferred cognitive style should not interfere with the person's ability to think critically.

Further research needs to be pursued on the teaching of critical thinking skills. This is a new area of research in nursing education which demands the attention of scholars. It is only through research that the nursing profession will increase its body of knowledge and become more autonomous.

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APPENDIX

Appendix A

Please complete and return with your tests

NAME _____

AGE _____

GENDER: MALE _____ FEMALE _____

COMPLETED YEARS OF COLLEGE _____

PREVIOUS WORK EXPERIENCE _____

I WOULD LIKE A COPY OF THE TEST RESULTS YES _____

NO _____

WATSON-GLASER

CRITICAL THINKING APPRAISAL

DIRECTIONS

This booklet contains five types of tests designed to find out how well you are able to reason analytically and logically. *Each test has separate directions that should be read carefully.*

Do not turn this page until instructed to do so.

Do not make any marks in this test booklet.

All answers are to be marked on the separate answer sheet provided. Use a sharp No. 2 lead pencil to mark your answers. If you wish to change an answer, be sure to erase your old answer completely.

**The Psychological Corporation**

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9-892901

TEST 1: INFERENCE

DIRECTIONS

An inference is a conclusion a person can draw from certain observed or supposed facts. For example, if the lights are on in a house and music can be heard coming from the house, a person might infer that someone is at home. But this inference may or may not be correct. Possibly the people in the house did not turn the lights and the radio off when they left the house.

*In this test, each exercise begins with a statement of facts that you are to regard as true. After each statement of facts you will find several possible inferences—that is, conclusions that some persons might draw from the stated facts. Examine each inference separately, and make a decision as to its *degree* of truth or falsity.*

For each inference you will find spaces on the answer sheet labeled T, PT, ID, PF, and F. For each inference make a mark on the answer sheet under the appropriate heading as follows:

- T** if you think the inference is definitely **TRUE**; that it properly follows beyond a reasonable doubt from the statement of facts given.
- PT** if, in the light of the facts given, you think the inference is **PROBABLY TRUE**; that it is more likely to be true than false.
- ID** if you decide that there are **INSUFFICIENT DATA**; that you cannot tell from the facts given whether the inference is likely to be true or false; if the facts provide no basis for judging one way or the other.
- PF** if, in the light of the facts given, you think the inference is **PROBABLY FALSE**; that it is more likely to be false than true.
- F** if you think the inference is definitely **FALSE**; that it is wrong, either because it misinterprets the facts given, or because it contradicts the facts or necessary inferences from those facts.

Sometimes, in deciding whether an inference is probably true or probably false, you will have to use certain commonly accepted knowledge or information that practically every person has. This will be illustrated in the example that follows.

Look at the example in the next column; the correct answers are indicated in the block at the right.

EXAMPLE

Two hundred students in their early teens voluntarily attended a recent weekend student conference in a Midwestern city. At this conference, the topics of race relations and means of achieving lasting world peace were discussed, since these were the problems the students selected as being most vital in today's world.

1. As a group, the students who attended this conference showed a keener interest in broad social problems than do most other students in their early teens.
2. The majority of the students had not previously discussed the conference topics in their schools.
3. The students came from all sections of the country.
4. The students discussed mainly labor relations problems.
5. Some teenage students felt it worthwhile to discuss problems of race relations and ways of achieving world peace.

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Test 1

	T	PT	ID	PF	F
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In the above example, inference 1 is probably true (PT) because (as is common knowledge) most people in their early teens do not show so much serious concern with broad social problems. It cannot be considered definitely true from the facts given because these facts do not tell *how much* concern other young teenagers may have. It is also possible that some of the students volunteered to attend mainly because they wanted a weekend outing.

Inference 2 is probably false (PF) because the students' growing awareness of these topics probably stemmed at least in part from discussions with teachers and classmates.

There is no evidence for inference 3. Thus there are insufficient data (ID) for making a judgment on the matter.

Inference 4 is definitely false (F) because it is given in the statement of facts that the topics of race relations and means of achieving world peace were the problems chosen for discussion.

Inference 5 necessarily follows from the given facts; it therefore is true (T).

In the exercises that follow, more than one of the inferences from a given statement of facts may be true (T), or false (F), or probably true (PT), or probably false (PF), or have insufficient data (ID) to warrant any conclusion. Thus you are to judge each inference independently.

Make a heavy black mark in the space under the heading that you think best describes each inference. If you change an answer, erase it thoroughly. Make no extra marks on the answer sheet.

EXERCISES

In 1946 the United States Armed Forces conducted an experiment called "Operation Snowdrop" to find out what kinds of military men seemed to function best under severe arctic climatic conditions. Some of the factors examined were weight, age, blood pressure, and national origin. All of the participants in "Operation Snowdrop" were given a training course in how to survive and function in extreme cold. At the conclusion of the experiment it was found that only two factors among those studied distinguished between men whose performance was rated as "effective" and those rated as "not effective" on the arctic exercises. These factors were: (1) desire to participate in the experiment, and (2) degree of knowledge and skill regarding how to live and protect oneself under arctic conditions.

1. Despite the training course given to all of the participants in "Operation Snowdrop," some participants exhibited greater arctic survival knowledge or skill than others.
2. It was believed by the Armed Forces that military operations might someday be carried out in an arctic-like environment.
3. A majority of the men who participated in "Operation Snowdrop" thoroughly disliked the experience.
4. As a group, the men of Scandinavian origin were found to function more effectively under severe arctic conditions than those of Latin origin.
5. Participants having normal weight and blood pressure were rated as significantly more effective on the arctic exercises than were the other participants.

Mr. Brown, who lives in the town of Salem, was brought before the Salem municipal court for the sixth time in the past month on a charge of keeping his pool hall open after 1 a.m. He again admitted his guilt and was fined the maximum, \$500, as in each earlier instance.

6. On some nights it was to Mr. Brown's advantage to keep his pool hall open after 1 a.m., even at the risk of paying a \$500 fine.
7. Mr. Brown's pool hall was held by the municipal court to be within the legal jurisdiction of the town of Salem.
8. Mr. Brown repeatedly flouted the 1 a.m. closing law in hopes of getting it repealed.
9. The maximum fine of \$500 was fully effective in keeping all pool halls in Salem and its vicinity closed after 1 a.m.
10. There was one week during the past month when Mr. Brown observed the legal closing time each night.

Some time ago a crowd gathered in Middletown to hear the new president of the local Chamber of Commerce speak. The president said, "I am not asking, but demanding, that labor unions now accept their full share of responsibility for civic improvement and community welfare. I am not asking, but demanding, that they join the Chamber of Commerce." The members of the Central Labor Unions who were present applauded enthusiastically. Three months later all the labor unions in Middletown were represented in the Chamber of Commerce. These representatives worked with representatives of other groups on committees, spoke their minds, participated actively in the civic improvement projects, and helped the Chamber reach the goals set in connection with those projects.

11. Both the labor union representatives and the other members of the committees came to a better recognition of one another's viewpoints through their Chamber of Commerce contacts.
12. Union participation in the Middletown Chamber of Commerce greatly reduced worker-management disputes in that town.
13. The active participation of the labor unions resolved many controversies at all the committee meetings of the Chamber of Commerce.
14. Most of the union representatives regretted having accepted the invitation to participate in the Chamber of Commerce.
15. Some of the Chamber of Commerce members came to feel that their president had been unwise in asking the union representatives to join the Chamber.
16. The new president indicated in the speech that the town's labor unions had not yet accepted their full responsibility for civic improvement.

Go on to the next page ►

TEST 2: RECOGNITION OF ASSUMPTIONS

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DIRECTIONS

An assumption is something presupposed or taken for granted. When you say, "I'll graduate in June," you take for granted or assume that you will be alive in June, that your school will judge you to be eligible for graduation in June, and similar things.

Below are a number of statements. Each statement is followed by several proposed assumptions. You are to decide for each assumption whether a person, in making the given statement, is really making that assumption—that is, taking it for granted, justifiably or not.

If you think that the given assumption is taken for granted in the statement, make a heavy black mark under "ASSUMPTION MADE" in the proper place on the answer sheet. If you think the assumption is *not* necessarily taken for granted in the statement, blacken the space under "ASSUMPTION NOT MADE." Remember to judge each assumption independently.

Below is an example. The block at the right shows how these items should be marked on the answer sheet.

EXAMPLE

Statement: "We need to save time in getting there so we'd better go by plane."

Proposed assumptions:

1. Going by plane will take less time than going by some other means of transportation. (It is assumed in the statement that the greater speed of a plane over the speeds of other means of transportation will enable the group to reach its destination in less time.)
2. There is plane service available to us for at least part of the distance to the destination. (This is necessarily assumed in the statement since, in order to save time by plane, it must be possible to go by plane.)
3. Travel by plane is more convenient than travel by train. (This assumption is not made in the statement—the statement has to do with saving time, and says nothing about convenience or about any other specific mode of travel.)

Test 2	
Assumption Made	Assumption Not Made
1 <input checked="" type="checkbox"/>	<input type="checkbox"/>
2 <input checked="" type="checkbox"/>	<input type="checkbox"/>
3 <input type="checkbox"/>	<input checked="" type="checkbox"/>

Statement: "Zenith is the city to move to—it has the lowest taxes."

Proposed assumptions:

20. Lower taxes imply efficient city management.
21. In deciding where to live, it is important to avoid high taxes.
22. The majority of the residents in Zenith are content with their present city government.

Statement: "We have permitted ourselves to be stamped into a life of unnatural and dangerous high pressure. We pace ourselves by machines instead of by our natural rhythm."

Proposed assumptions:

23. We can resist being pushed into a life of unnatural high pressure.
24. The way of life we have adopted is not in tune with the way human beings were meant to live.
25. The rapid pace of our lives does not help us to achieve our goals.

Statement: "I'm traveling to South America. I want to be sure that I do not get typhoid fever, so I shall go to my physician and get vaccinated against typhoid fever before I begin my trip."

Proposed assumptions:

26. If I don't take the injection, I shall become ill with the fever.
27. By getting vaccinated against typhoid fever, I decrease the chances that I will get the disease.
28. Typhoid fever is more common in South America than it is where I live.
29. My physician can provide me with a vaccination that will protect me from getting typhoid fever while I am in South America.

EXERCISES

Statement: "In the long run, the discovery of additional uses for atomic energy will prove a blessing to humanity."

Proposed assumptions:

17. Additional and beneficial ways of using atomic energy will be discovered.
18. The discovery of additional uses for atomic energy will require large, long-term investments of money.
19. The use of atomic energy represents a serious environmental hazard.

Statement: "If war is inevitable, we'd better launch a preventive war now while we have the advantage."

Proposed assumptions:

30. War is inevitable.
31. If we fight now, we are more likely to win than we would be if forced to fight later.
32. If we don't launch a preventive war now, we'll lose any war that may be started by an enemy later.

TEST 3: DEDUCTION

60

DIRECTIONS

In this test, each exercise consists of several statements (premises) followed by several suggested conclusions. *For the purposes of this test, consider the statements in each exercise as true without exception.* Read the first conclusion beneath the statements. If you think it *necessarily* follows from the statements given, make a heavy black mark under "CONCLUSION FOLLOWS" in the proper place on the answer sheet. If you think it is *not a necessary conclusion* from the statements given, put a heavy black mark under "CONCLUSION DOES NOT FOLLOW," even though you may believe it to be true from your general knowledge.

Likewise, read and judge each of the other conclusions. Try not to let your prejudices influence your judgment—just stick to the given statements (premises) and judge each conclusion as to whether it *necessarily* follows from them.

The word "some" in any of these statements means an indefinite part or quantity of a class of things. "Some" means *at least* a portion, and *perhaps* all of the class. Thus, "Some holidays are rainy" means *at least* one, possibly more than one, and *perhaps* even all holidays are rainy.

Study the example carefully before starting the test.

EXAMPLE

Some holidays are rainy. All rainy days are boring. Therefore—

1. No clear days are boring. (The conclusion does not follow. You cannot tell from the statements whether or not clear days are boring. Some may be.)
2. Some holidays are boring. (The conclusion necessarily follows from the statements since, according to them, the rainy holidays must be boring.)
3. Some holidays are not boring. (The conclusion does not follow, even though you may know that some holidays are very pleasant.)

Test 3	
Conclusion Follows	Does Not Follow
1 <input type="checkbox"/>	<input checked="" type="checkbox"/>
2 <input checked="" type="checkbox"/>	<input type="checkbox"/>
3 <input type="checkbox"/>	<input checked="" type="checkbox"/>

EXERCISES

No person who thinks scientifically places any faith in the predictions of astrologers. Nevertheless, there are many people who rely on horoscopes provided by astrologers. Therefore—

33. People who lack confidence in horoscopes think scientifically.
34. Many people do not think scientifically.
35. Some scientific thinkers trust some astrologers.

All members of symphony orchestras enjoy playing classical music. All members of symphony orchestras spend long hours practicing. Therefore—

36. Musicians who play classical music do not mind spending long hours practicing.
37. Some musicians who spend long hours practicing enjoy playing classical music.

Rice and celery must have a good deal of moisture in order to grow well, but rye and cotton grow best where it is relatively dry. Rice and cotton grow where it is hot, and celery and rye where it is cool. In Timbuktu, it is very hot and damp. Therefore—

38. Neither the temperature nor the moisture conditions in Timbuktu are favorable for growing a celery crop.
39. The temperature and moisture conditions in Timbuktu are more favorable for growing rice than for growing celery, cotton, or rye.
40. Conditions in Timbuktu are not altogether favorable for growing a cotton or a rye crop.

Most persons who attempt to break their smoking habit find that it is something that they can accomplish only with difficulty, or cannot accomplish at all. Nevertheless, there is a growing number of individuals whose strong desire to stop smoking has enabled them to break the habit permanently. Therefore—

41. Only smokers who strongly desire to stop smoking will succeed in doing so.
42. A strong desire to stop smoking helps some people to permanently break the habit.

In one town there are 52 classes in the five elementary schools. Each class contains from 10 to 40 pupils. Therefore—

43. There are at least two classes in the town with exactly the same number of pupils.
44. Most elementary school classes in the town contain more than 15 pupils.
45. There are at least 550 pupils in these elementary schools.

Some Russians would like to control the world. All Russians seek a better life for themselves. Therefore—

46. Some people who would like to control the world seek a better life for themselves.
47. Some people who seek a better life for themselves would like to control the world.
48. If the Russians controlled the world, they would be assured of a better life.

TEST 4: INTERPRETATION

CTIONS

exercise below consists of a short paragraph followed by several suggested conclusions.

For the purpose of this test, assume that everything in the short paragraph is true. The problem is to judge whether or not each of the proposed conclusions logically follows beyond a reasonable doubt from the information given in the paragraph.

If you think that the proposed conclusion follows beyond a reasonable doubt (even though it may not follow absolutely and necessarily), then make a heavy black mark under "CONCLUSION FOLLOWS" in the proper space on the answer sheet. If you think that the conclusion does *not* follow beyond a reasonable doubt from the information given, then blacken the space under "CONCLUSION DOES NOT FOLLOW." Remember to judge each conclusion independently.

Look at the example below; the block at the right shows how the answers should be marked on the answer sheet.

EXAMPLE

A study of vocabulary growth in children from eight months to six years old shows that the size of spoken vocabulary increases from zero words at age eight months to 2562 words at age six years.

1. None of the children in this study had learned to talk by the age of six months. (The conclusion follows beyond a reasonable doubt since, according to the statement, the size of the spoken vocabulary at eight months was zero words.)
2. Vocabulary growth is slowest during the period when children are learning to walk. (The conclusion does not follow since there is no information given that relates growth of vocabulary to walking.)

Test 4	
Conclusion Follows	Does Not Follow
1 <input checked="" type="checkbox"/>	<input type="checkbox"/>
2 <input type="checkbox"/>	<input checked="" type="checkbox"/>

EXERCISES

61

The history of the last 2000 years shows that wars have steadily become more frequent and more destructive. The twentieth century has the worst record thus far on both these counts.

49. Mankind has not advanced much in the ability to keep peace.
50. If past trends continue, we can expect that there will be more wars in the twenty-first century than there were in the twentieth century.
51. Wars have become more frequent and more destructive because the world's natural resources have become more valuable.

When the United States Steel Corporation was created in 1902, it was the largest corporation America had known up to that time. It produced twice as much steel as all of its domestic competitors put together. Today, the United States Steel Corporation produces about 20 percent of the steel that is made in this country.

52. In 1902, the United States Steel Corporation produced not less than 66 percent of the total domestic output of steel.
53. Today, domestic competitors produce more than three times as much steel as does the United States Steel Corporation.
54. The United States Steel Corporation produces less steel today than it did in 1902.

Pat had poor posture, had very few friends, was ill at ease in company, and in general was very unhappy. Then a close friend recommended that Pat visit Dr. Baldwin, a reputed expert on helping people improve their personalities. Pat took this recommendation and, after three months of treatment by Dr. Baldwin, developed more friendships, was more at ease, and in general felt happier.

55. Without Dr. Baldwin's treatment, Pat would not have improved.
56. Improvements in Pat's life occurred after Dr. Baldwin's treatment started.
57. Without a friend's advice, Pat would not have heard of Dr. Baldwin.

In a certain city where school attendance laws are strictly enforced, it was found that only 15 percent of the students had a perfect attendance record during a single school semester. Among those who sold newspapers, however, 25 percent had a perfect attendance record during the same semester.

- 58. Students who sold newspapers were more likely to have perfect attendance records during the semester than students who did not.
- 59. Strict enforcement of school attendance laws in this city did not prevent 85 percent of the students from being absent sometime during the semester.
- 60. If truants were given jobs selling newspapers, their school attendance would improve.
- 61. The low rate of perfect attendance by students in that school system was due mainly to illness or injury.

When I go to bed at night, I usually fall asleep quite promptly. But about twice a month I drink coffee during the evening, and whenever I do, I lie awake and toss for hours.

- 62. My problem is mostly psychological; I expect that the coffee will keep me awake and therefore it does.
- 63. I don't fall asleep promptly at night after drinking coffee because the caffeine in it overstimulates my nervous system.
- 64. On nights when I want to fall asleep promptly, I'd better not drink coffee in the evening.

Go on to the next page ►

TEST 5: EVALUATION OF ARGUMENTS

63

DIRECTIONS

In making decisions about important questions, it is desirable to be able to distinguish between arguments that are strong and arguments that are weak, as far as the question at issue is concerned. *For an argument to be strong, it must be both important and directly related to the question.*

An argument is weak if it is not directly related to the question (even though it may be of great general importance), or if it is of minor importance, or if it is related only to trivial aspects of the question.

Below is a series of questions. Each question is followed by several arguments. *For the purpose of this test, you are to regard each argument as true.* The problem then is to decide whether it is a *strong* or a *weak* argument.

Make a heavy black mark on the answer sheet under "ARGUMENT STRONG" if you think the argument is strong, or under "ARGUMENT WEAK" if you think the argument is weak. Judge each argument separately on its own merit. *Try not to let your personal attitude toward the question influence your evaluation of the argument, since each argument is to be regarded as true.*

In the example, note that the argument is evaluated as to how well it supports the side of the question indicated.

EXAMPLE

Should all young men in the United States go to college?

1. Yes; college provides an opportunity for them to learn school songs and cheers. (This would be a silly reason for spending years in college.)
2. No; a large percent of young men do not have enough ability or interest to derive any benefit from college training. (If this is true, as the directions require us to assume, it is a weighty argument against all young men going to college.)
3. No; excessive studying permanently warps an individual's personality. (This argument, although of great general importance when accepted as true, is not directly related to the question, because attendance at college does not necessarily require excessive studying.)

Test 5	
Argument	
Strong	Weak
1 <input type="checkbox"/>	<input checked="" type="checkbox"/>
2 <input checked="" type="checkbox"/>	<input type="checkbox"/>
3 <input type="checkbox"/>	<input checked="" type="checkbox"/>

When the word "should" is used as the first word in any of the following questions, its meaning is, "Would the proposed action promote the general welfare of the people in the United States?"

EXERCISES

Would a strong labor party promote the general welfare of the people of the United States?

65. No; a strong labor party would make it unattractive for private investors to risk their money in business ventures, thus causing sustained large-scale unemployment.
66. Yes; differences between Republicans and Democrats today are not as great as the differences between liberals and conservatives within those parties.
67. No; labor unions have called strikes in a number of important industries.

Should groups in this country who are opposed to some of our government's policies be permitted unrestricted freedom of press and speech?

68. Yes; a democratic state thrives on free and unrestricted discussion, including criticism.
69. No; the countries opposed to our form of government do not permit the free expression of our points of view in their territories.
70. No; if given full freedom of press and speech, opposition groups would cause serious internal strife, making our government basically unstable, and eventually leading to the loss of our democracy.

Should the United States Department of Defense keep the public informed of its anticipated scientific research programs by publicizing ahead of time the needs that would be served by each program?

71. No; some become critical of the government when widely publicized projects turn out unsuccessfully.
72. Yes; only a public so informed will support vital research and development activities with its tax dollars.
73. No; it is essential to keep certain military developments secret for national security and defense reasons.

Do juries decide court cases fairly when one of the opposing parties is rich and the other is poor?

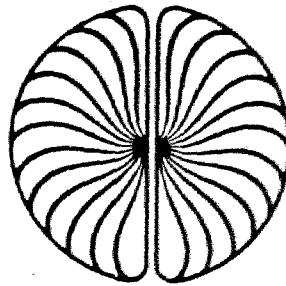
74. No; because rich people are more likely to settle their cases out of court.
75. No; most jurors are more sympathetic to poor people than to the rich, and the jurors' sympathies affect their findings.
76. No; because rich people can afford to hire better lawyers than poor people, and juries are influenced by the skill of the opposing lawyers.

Should pupils be excused from public schools to receive religious instruction in their own churches during school hours?

77. No; having public-school children go off to their separate churches during school hours would seriously interfere with the educational process and create friction among children of different religions.
78. Yes; religious instruction would help overcome moral emptiness, weakness, and lack of consideration for other people, all of which appear to be current problems in our nation.
79. Yes; religious instruction is very important to the preservation of our democratic values.
80. No; religious instruction during school hours would violate our constitutional separation of church and state; those who desire such instruction are free to get it after school hours.

STOP.

You may go back and check your work.



human information processingTM SURVEY

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**Instructions for Completing the
Human Information Processing Survey
Research Edition**

For each item, select the one alternative that you feel is most descriptive of you. Even in cases where you think none of the three choices is really descriptive, select the one that is best for you. You need to respond to all forty items for your feedback to be compared to other people who have completed this Survey.

For example, consider these three choices:

- | | |
|---|---|
| A. prefer to use logical analysis in making a decision | A |
| B. no preference for logical or intuitive decision making | B |
| C. prefer to use my intuition in arriving at a decision | C |

Choose the letter of the choice that is most descriptive of you. If choice "B" is more like you than either "A" or "C," mark "B" in the manner described by your Survey administrator. Follow the instructions of the Survey administrator in marking your choice for each of the forty items on this Survey. If for any reason you change your mind, erase your original choice and then indicate your new preference.

Begin with the first set and make your choice for each successive set of three. You have as much time as you need to complete this Survey, but generally the best response is the first strong impression you have after carefully reading the three alternatives. Detailed analysis of the response choices will probably not provide a more accurate description of your preferences.

he right-hand column, select the one choice which is most descriptive of you. Do this for *each* item on the way. Follow the instructions of the Survey administrator for marking your choices.

- | | |
|---|---|
| A usually learn or remember only those things specifically studied | A |
| B good memory for details and facts in the environment not specifically studied | B |
| C have noticed no difference in my abilities in these areas | C |
| <hr/> | |
| A like to read fantasy stories | A |
| B like to read realistic stories | B |
| C no preference between fantasy and realistic stories | C |
| <hr/> | |
| A equally as much fun to dream as to plan realistically | A |
| B more fun to dream | B |
| C more fun to plan realistically | C |
| <hr/> | |
| A listen to music or radio while reading or studying | A |
| B must have total quiet in order to read or study | B |
| C listen to music or radio only if reading for enjoyment, not if studying | C |
| <hr/> | |
| A would like to write fiction books | A |
| B would like to write non-fiction books | B |
| C no preference between writing fiction and non-fiction | C |
| <hr/> | |
| A if seeking mental health counseling, would prefer group counseling and sharing feelings with others | A |
| B if seeking mental health counseling, would prefer the confidentiality of individual counseling | B |
| C have no preference for group over individual counseling | C |
| <hr/> | |
| A enjoy drawing my own images and ideas | A |
| B enjoy copying and filling in details | B |
| C enjoy drawing my own images and copying and filling in equally | C |
| <hr/> | |
| A believe I could be easily hypnotized | A |
| B could probably be hypnotized but it would be difficult | B |
| C do not believe I could be hypnotized | C |
| <hr/> | |
| A no preference between mystery stories and action stories | A |
| B prefer action stories | B |
| C prefer mystery stories | C |
| <hr/> | |
| A no preference between algebra and geometry | A |
| B prefer algebra | B |
| C prefer geometry | C |

Go on to the next page.

- | | | | |
|-------|---|--|---|
| 11. | A | like to organize things sequentially | A |
| | B | like to organize things to show relationships | B |
| | C | no preference for sequential over relational organization | C |
| <hr/> | | | |
| 12. | A | good at remembering verbal materials | A |
| | B | good at tonal (musical sound) memory | B |
| | C | equally good at verbal and tonal memory | C |
| <hr/> | | | |
| 13. | A | pace personal activity to time limits with ease | A |
| | B | use time to organize self and personal activities | B |
| | C | have difficulty in pacing personal activities to time limits | C |
| <hr/> | | | |
| 14. | A | have frequent mood changes | A |
| | B | have few mood changes | B |
| | C | stable, almost no mood changes | C |
| <hr/> | | | |
| 15. | A | skilled in communicating with animals | A |
| | B | moderately good in communicating with animals | B |
| | C | cannot communicate very well with animals | C |
| <hr/> | | | |
| 16. | A | no preference for cats over dogs or vice versa | A |
| | B | preference for cats | B |
| | C | preference for dogs | C |
| <hr/> | | | |
| 17. | A | enjoy clowning around | A |
| | B | can clown or be serious depending upon the occasion | B |
| | C | do not enjoy clowning around | C |
| <hr/> | | | |
| 18. | A | frequently somewhat absent-minded | A |
| | B | occasionally absent-minded | B |
| | C | almost never absent-minded | C |
| <hr/> | | | |
| 19. | A | when viewing advertisements, am most often influenced by attractive signs, pleasant scenes, and sensual overtones | A |
| | B | when viewing advertisements, am most often influenced by the information comparing several products and demonstrating which works the best | B |
| | C | primarily influenced by the advertising medium only when accompanied by information on the quality of the product | C |
| <hr/> | | | |
| 20. | A | no preference for demonstration over verbal instructions | A |
| | B | prefer demonstration | B |
| | C | prefer verbal instructions | C |

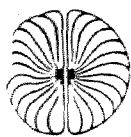
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21.	A	equally valuable to discuss stories and illustrate them	68	A
	B	more valuable to discuss stories read		B
	C	more valuable to illustrate stories read		C
22.	A	equally valuable to tell stories and to act out stories		A
	B	more valuable to tell stories		B
	C	more valuable to act out stories		C
23.	A	moving rhythmically and rhyming are equally enjoyable		A
	B	moving rhythmically is more fun		B
	C	rhyming is more fun		C
24.	A	would like to do impromptu interpretive dancing		A
	B	would like to do ballet dancing		B
	C	no preference for ballet over impromptu interpretive dancing		C
25.	A	enjoy interacting affectively with others		A
	B	enjoy interpreting the affective interaction of others		B
	C	equal preference for affective interaction and interpretation of the affective interaction of others		C
26.	A	can think better while lying down		A
	B	can think better while sitting up straight		B
	C	equal preference for thinking while lying down or sitting up straight		C
27.	A	would like to be a music critic		A
	B	would like to be a music composer		B
	C	would enjoy equally music criticism and composition		C
28.	A	skilled in the intuitive prediction of outcomes		A
	B	skilled in the statistical, scientific prediction of outcomes		B
	C	equally skilled in intuitive and statistical/scientific prediction		C
29.	A	generally attentive to verbal explanations		A
	B	generally restless during verbal explanations		B
	C	can control attention during verbal explanations		C
30.	A	enjoy analyzing stories		A
	B	enjoy creative storytelling		B
	C	enjoy equally analyzing stories and creative storytelling		C

Go on to the next page.

31.	A	conforming or nonconforming depending upon the situation	69 A
	B	generally conforming	B
	C	generally nonconforming	C
32.	A	no preference for well-structured over open-ended assignments	A
	B	preference for open-ended assignments	B
	C	preference for well-structured assignments	C
33.	A	prefer to learn through free exploration	A
	B	prefer to learn systematically through ordering and planning	B
	C	no preference between learning through free exploration and learning through more systematic ways	C
34.	A	strong in recalling verbal materials (names, dates, etc.)	A
	B	strong in recalling spatial imagery	B
	C	equally strong in recalling verbal and spatial imagery	C
35.	A	read for main ideas	A
	B	read for specific details and facts	B
	C	read for main ideas and for details and facts equally	C
36.	A	skilled in sequencing ideas	A
	B	skilled in showing relationships among ideas	B
	C	equally skilled in sequencing and showing relationships	C
37.	A	no preference between outlining and summarizing readings	A
	B	preference for outlining over summarizing	B
	C	preference for summarizing over outlining	C
38.	A	producing ideas and drawing conclusions are equally enjoyable	A
	B	drawing conclusions is more fun	B
	C	producing ideas is more fun	C
39.	A	solve problems logically, rationally	A
	B	solve problems intuitively	B
	C	equally skilled in solving problems intuitively and logically	C
40.	A	just as exciting to me to improve something as to invent something new	A
	B	more exciting to improve something	B
	C	more exciting to invent something new	C

When you have completed all forty items, follow the instructions of your Survey administrator.



human information PROCESSING[®] SURVEY

70

RESEARCH EDITION

Response Sheet

Name _____ Date _____

For each item of the Survey, select the one alternative that best describes you. Indicate your choice by circling the letter "A," "B," or "C" next to the number of that item in the list below.

When you have completed all forty items, follow the instructions of your Survey administrator for completion of this sheet.

1. A B C _____
2. A B C _____
3. A B C _____
4. A B C _____
5. A B C _____
6. A B C _____
7. A B C _____
8. A B C _____
9. A B C _____
10. A B C _____
11. A B C _____
12. A B C _____
13. A B C _____
14. A B C _____
15. A B C _____
16. A B C _____
17. A B C _____
18. A B C _____
19. A B C _____
20. A B C _____

21. A B C _____
22. A B C _____
23. A B C _____
24. A B C _____
25. A B C _____
26. A B C _____
27. A B C _____
28. A B C _____
29. A B C _____
30. A B C _____
31. A B C _____
32. A B C _____
33. A B C _____
34. A B C _____
35. A B C _____
36. A B C _____
37. A B C _____
38. A B C _____
39. A B C _____
40. A B C _____

Your Raw Scores → $\square + \square + \square = 40$
Ls Is Rs

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Appendix D

Information sheet for consent to be a research subject

A study is being done by Marge Bledsoe R.N., a graduate student at Drake University, to learn about the relationship of preferred thinking styles to critical thinking ability. The study will also compare freshmen nursing students' results with non-nursing students' results.

If you agree to participate you will be asked to complete two different tools. The first is the Watson-Glaser Critical THinking Appraisal which determines how you are able to reason analytically and logically. The second is the Human Information Processing Survey which determines your preferred cognitive style. It will take approximately an hour to complete both tools.

After participating you may obtain a copy of your results on both tools. These would indicate your critical thinking ability and your preferred style of thinking.

All data obtained on you during the course of this study will be kept confidential and accessible only to the principal investigator. If you have other questions you may call Ms. Bledsoe at 283-6804.

Consent form to be a research subject

Participation in this study is voluntary. No compensation for participation will be given. I understand that I am free to withdraw my consent to participate in this study at any time without prejudice to my grades. Refusing to participate will involve no penalty.

The confidentiality of information concerning my participation in this study will be maintained whenever possible. This information may be disclosed to other educators and researchers and may be published as research. Any published material will not identify me by name.

I have read the information sheet, asked questions, received answers concerning areas I did not understand, and willingly give my consent to participate in this program.. Upon signing this form, I will receive a copy.

Subject's signature

date

Witness's signature

date

Investigator's signature

date